Ultra Low Sulfur Diesel Handling

Industry/EPA Ultra Low Sulfur Diesel Workshop
Astor Crowne Plaza
New Orleans, LA
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Products Transported

- Pipelines move multiple products with wide variances in sulfur levels
  - Heating Oil – up to 5000ppm
  - Jet Fuel – up to 3000ppm
  - Gasoline – up to 300ppm
  - LSD – up to 500ppm
  - ULSD – up to 15ppm
- Keeping additional sulfur away from ULSD is a significant challenge

United States Transportation Network is Complex

- Multiple hand offs occur between pipelines, intermediate tank farms, other modes of transportation
- Particularly complex in the Mid Continent and East Coast
- The potential for sulfur increase occurs at each hand off shrinking the ULSD batch
- Best case, as much as 1-2ppm is added each hand off

What are Pipelines Doing ?

- Thorough examination of each Pipeline's link(s) in the supply chain is critical and unique
  - Review suppliers to identify contamination sources on receipt
  - Identify sulfur contamination potential from handling equipment
  - Manage interface generation
  - Manage In-transit contamination

Review of Suppliers

- Identify points of contamination within each supplier's facility
- Dedicate systems to ULSD wherever practical
- Calculate line displacements
- Update displacement procedures
- Modify batch sequencing
- Enhance training

Sulfur Contamination by Equipment

- Valves, manifolds, pumps, dead leg piping, drain lines, flush lines, relief lines, pump line ups, meters, provers, filter vessels, sumps, etc.
  - Preventive maintenance
  - Isolate/dedicate lines & equipment when possible
  - Modify operating procedures
  - Line and equipment labeling

Managing Interface Generation

- Recalculate optimal line flush volumes to protect product
- Minimize transmix and interface
- Pursue interface detection equipment and techniques

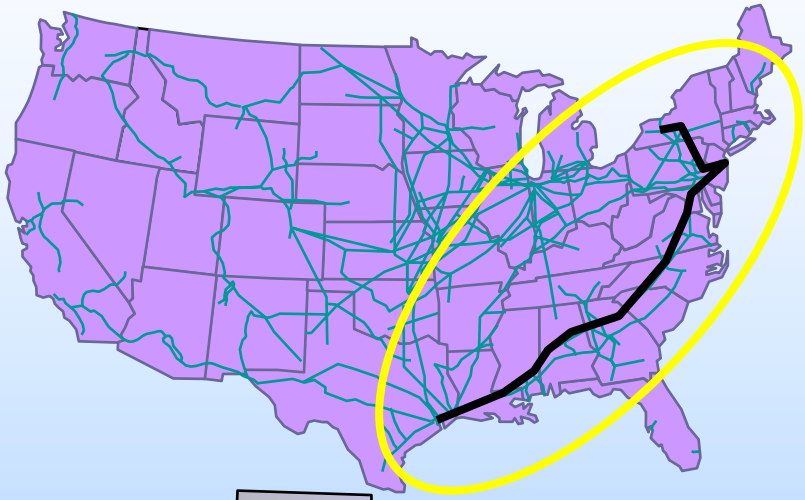
In-Transit Contamination

- Starting/stopping pumps
- Pipeline hydraulics
  - Laminar versus turbulent flow
  - Line pack
  - Elevation changes
- Pipeline maintenance and repair
  - Purges
  - Drain ups
  - Re-injections
- Pigging
- Batch sequencing
  - Can be used to transition sulfur levels
  - Limited to the market demands of the pipeline’s service area

Sulfur Sources, Downgrades

Movement	Sulfur Contamination	Downgrade in Barrels 12" Pipeline	36" Pipeline
Refinery Gate	7 ppm	100,000	100,000
Pipeline	<1 ppm	(1,100)	(9,600)
Tank Farm	1 - 5 ppm		
Truck	<1 ppm	(100)	(100)
Retail	<1 ppm		
Subtotal	9 -13 ppm	98,800	90,300
Test Reproducibility	4 - 6 ppm		
Total Sulfur	13 -19 ppm		
EPA Test Tolerance	-2 ppm		
Final Sulfur	11 -17 ppm		
A 2nd shipment	12 - 22 ppm	97,600	80,600
A 3rd shipment	13 - 27 ppm	96,400	78,400

Scenario 1: Houston to NY State



Out of Compliance

To Buckeye: +1

Linden: +1

Macungie: +1 (15 ppm)

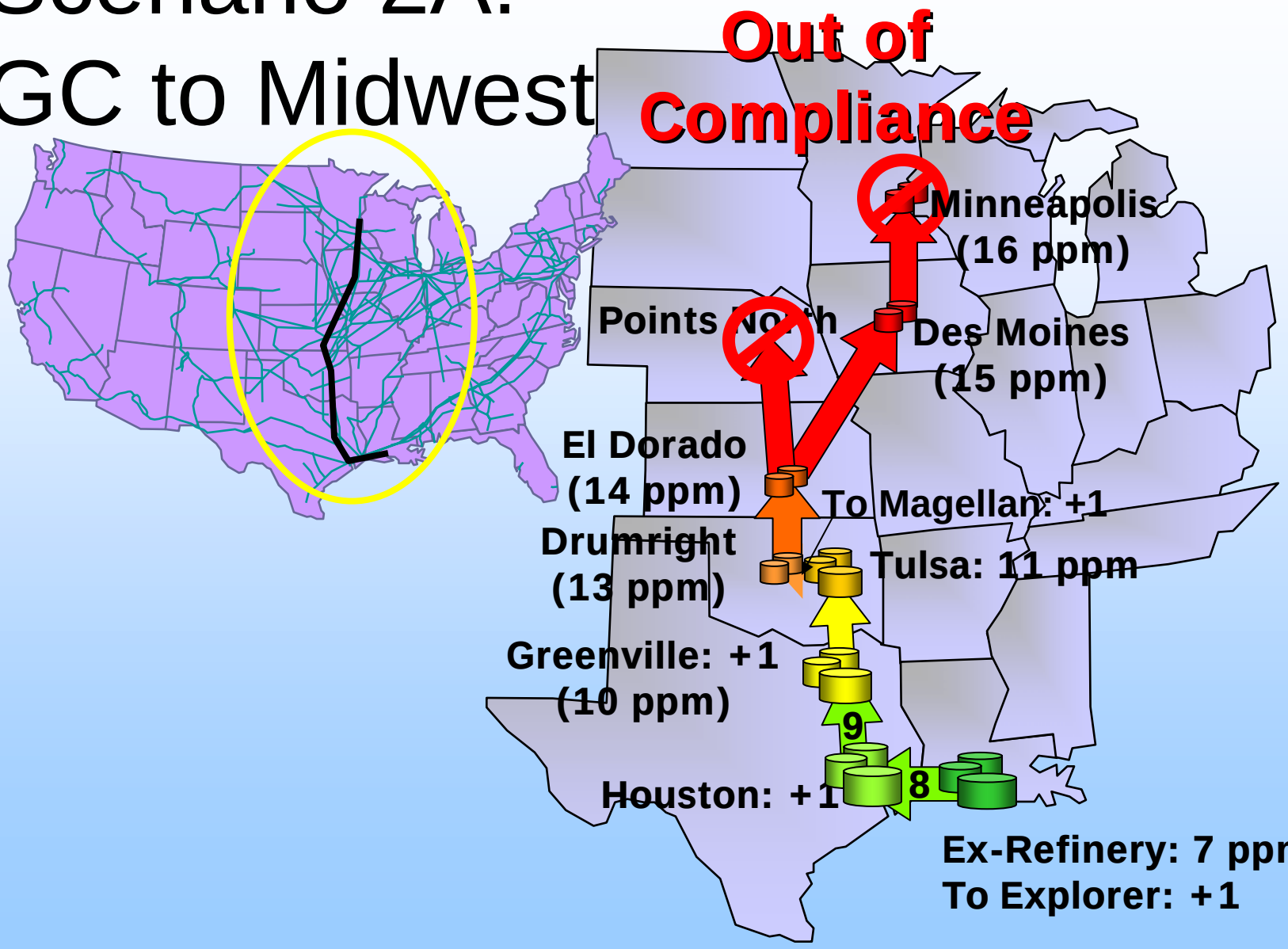
12

Greensboro Breakout: +1

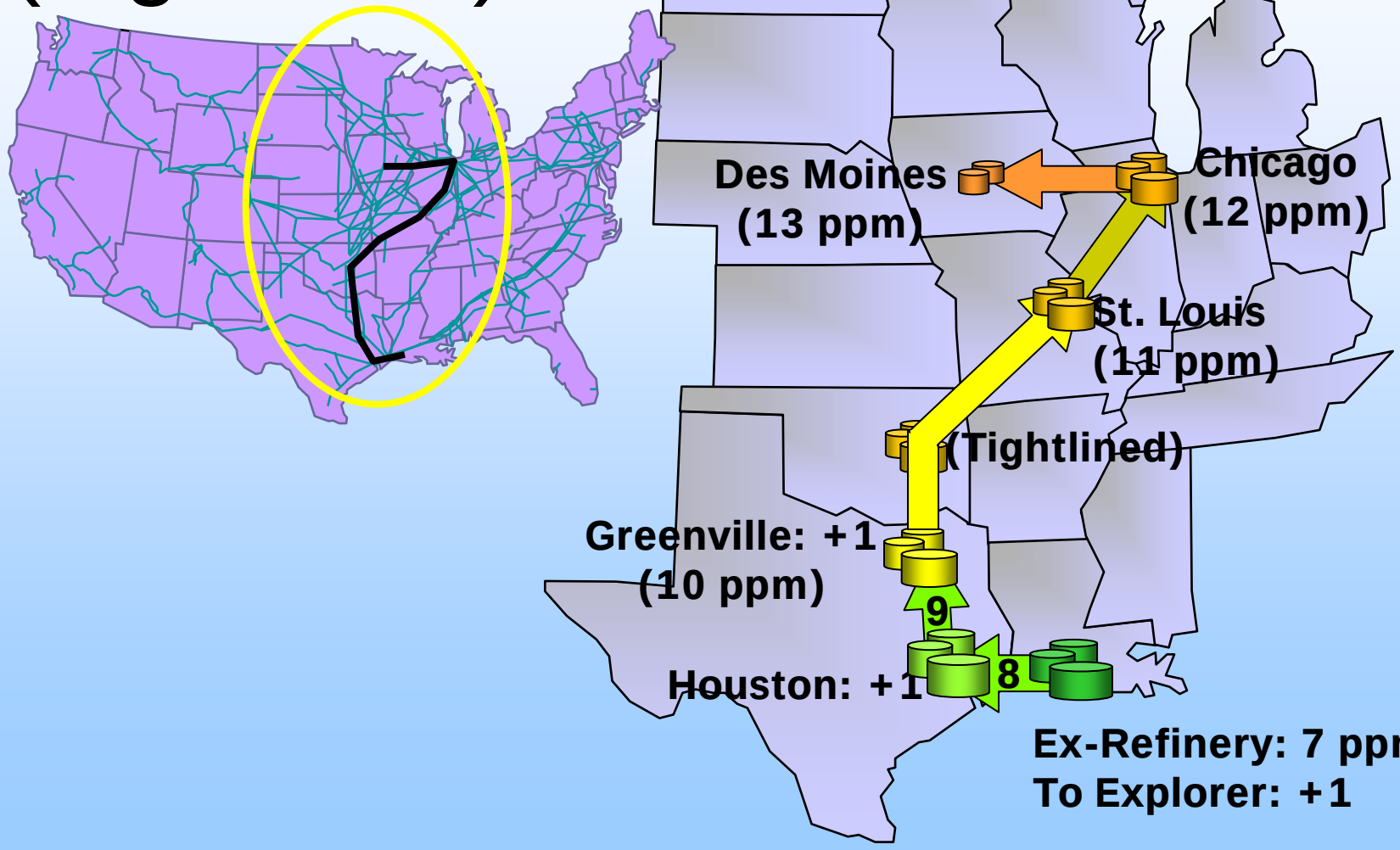
10

Ex-Refinery: 7 ppm
To KM: +1 (8 ppm)
To Colonial: +1 (9 ppm)

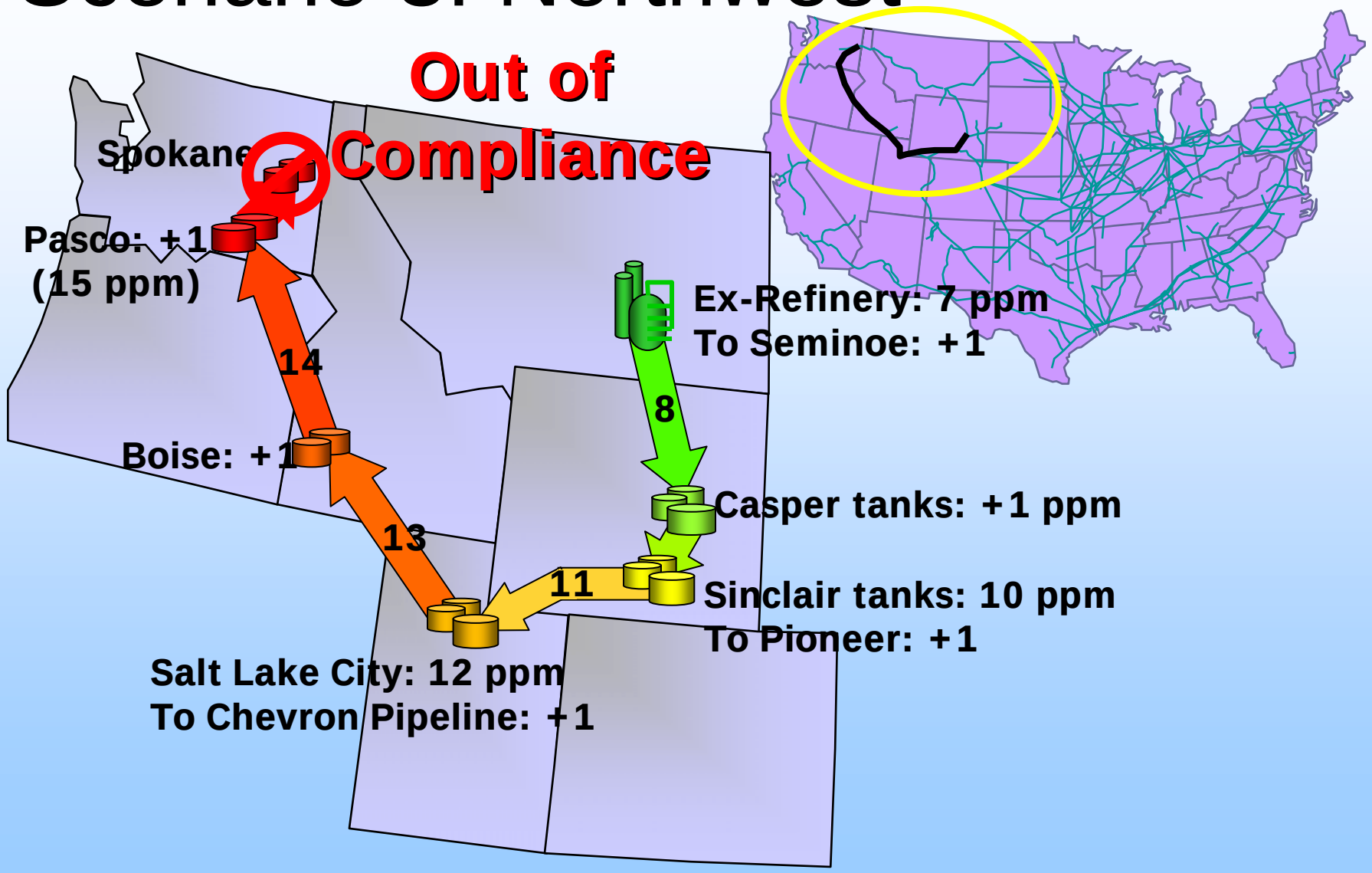
Scenario 2A: GC to Midwest



Scenario 2B: GC to Midwest (Tightlined)



Scenario 3: Northwest



Complexities in U.S. Systems Contrast to Europe's RMR

- Biggest multi-product pipeline in Europe
- 320 miles of 20” pipe
- Batched system, 10% 10 ppm gas, 15% HSD, 20% ULSD, 15% jet, 30% naphtha
- Use batching spheres
- No mid-point injection
- No break-out tanks
- No hand-off

Transportation Testing Network

- Small pockets of 15ppm in production now
- More ratable volumes are needed now to test the handling practices of the industry
- Capital expenditures are needed to manage sulfur contamination
  - How much capital?
  - On what should it be spent?
- Testing is an iterative process

How Much ULSD for Testing

- Gulf Coast origin – 1.2 million barrels
- West Coast origin – 300 thousand barrels
- Midwest origin – 300 thousand barrels
- East Coast origin – 200 thousand barrels
- TOTAL – Approx 2 million barrels

Summary

- Additional testing critical to success
- Increase ULSD batch sizes in anticipation of downgrades
- Use an oversight program to monitor suppliers and manage contamination downstream
- Need better interface detection and batch tracking capabilities
- Reduce sulfur in or elect not to transport products with high sulfur contents
- Consider not accepting LSD since this will be generated in-transit
- Pipeline realities may dictate new distribution patterns
- Pipeline receipt sulfur specs to reflect new realities